

# Air Leakage Test Report

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In Compliance with Danish European Norm EN13829 – Denmark

*INSERT COMPANY LOGO*

Arkitektfirmaet Byg & Bo ApS

Building Address:	Blåbærhaven 1F 2670 Greve,
Performed for:	Unika Huse
Performed by:	Morten Sunne
Test date:	2016-05-02
Associated Test file:	Blåbærhaven 1F, 2670 Greve
Report Number:	
Unique Property ID Number:	

## Summary

 FanTestic	version: 5.8.37	licensed to: Arkitektfirmaet Byg & Bo ApS
Test date: 2016-05-02	By: Morten Sunne	
Customer:	Unika Huse	
Building Lot Number:		
Building address:	Blåbærhaven 1F 2670 Greve,	

Building and Test Information	
Test file name:	Blåbærhaven 1F, 2670 Greve
Building volume:	0
Building Height (from ground to top):	0
Floor Area:	138
Envelope Area:	0
Building Exposure to wind	Delvis beskyttet bygning
Accuracy of measurements	95%

Resultater	
Air flow at 50 Pa, $V_{50}$ [L/s]	34,85
Air changes at 50 Pa, $n_{50}$ [/h]	
Permeability at 50 Pa, $q_{50}$ [L/s/m <sup>2</sup> ]	
Specific leakage at 50 Pa, $w_{50}$ [L/s/m <sup>2</sup> ]	0,252
Effective leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	38,25
Equivalent leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	62,70
Normalized Leakage Area [cm <sup>2</sup> /m <sup>2</sup> ]:	

## Compliance

## Assumptions and warnings

While FanTestic software may calculate air leakage results based on user input, use of this software does not in any way guarantee these results.

## Building Information

### Building Measurements

Building Volume [m<sup>3</sup>]: 0

Envelope Area ( $A_{T\text{ BAT}}$ ) [m<sup>2</sup>]: 0

Floor Area ( $A_F$ ) [m<sup>2</sup>]: 138

### Heating/Ventilation System

HVAC Systems Present:

### Pictures

### Test Method

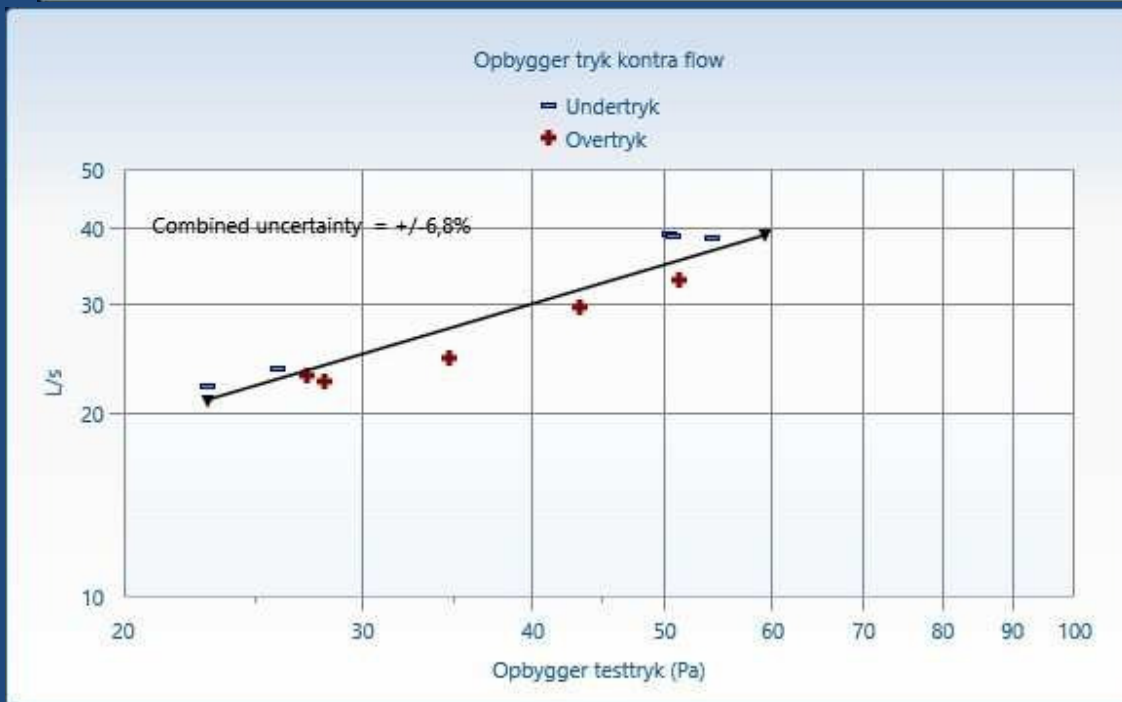
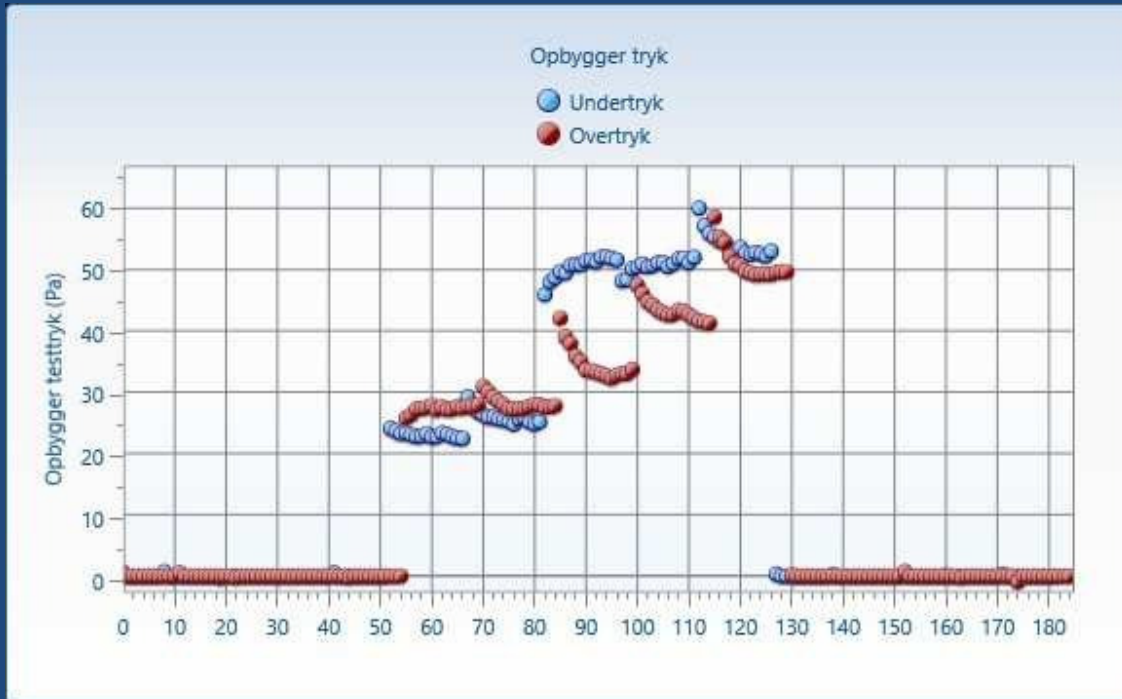
#### Test Notes:

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### Discussion of Results

#### Kombinerede testdata

	Resultater	95% konfidens interval		Usikkerhed pga. vind
Air flow at 50 Pa, $V_{50}$ [L/s]	34,85	32,60	37,25	+/-6,8%
Air changes at 50 Pa, $n_{50}$ [/h]				
Permeability at 50 Pa, $q_{50}$ [L/s/m <sup>2</sup> ]				
Specific leakage at 50 Pa, $w_{50}$ [L/s/m <sup>2</sup> ]	0,252	0,012	0,493	+/-95,3%
Effective leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	38,25	35,75	40,90	+/-7,1%
Equivalent leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	62,70	58,61	67,05	+/-6,8%
Normalized leakage area at 50 Pa [cm <sup>2</sup> /m <sup>2</sup> ]				



## Air Leakage Test Data Appendix-

### Undertryk Data Set

Test Dataset Date and Time: 2016-04-29-07:01

FinishTime: 07:07

Environmental Conditions		
Wind speed:	2: Let brise	from the
Operator Location:	Indendørs the building	
Initial Bias Pressure:	0,17 Pa	
Final Bias Pressure:	0,19 Pa	

Initial Temperature:	indoors: 20	outdoors: 10.
Final Temperature:	indoors: 20	outdoors: 10.
Barometric Pressure	101,3 kPa	from Standardtemperatur og tryk

UndertrykTest Analysis				
Correlation, r [%]:	99,59			
	Mean	95% confidence limits		Uncertainty
		Lower	Upper	
Slope, n:	0,703	0,58566	0,82063	
Air leakage coefficient, $C_{env}$ [L/s/Pa <sup>n</sup> ]:	2,3386	1,520	3,597	
Air leakage coefficient, $C_L$ [L/s/Pa <sup>n</sup> ]:	2,3628	1,536	3,634	
Air flow at 50 Pa, $V_{50}$ [L/s]	36,987	35,06	39,02	+/-5,4%
Air changes at 50 Pa, $n_{50}$ [/h]				
Permeability at 50 Pa, $q_{50}$ [L/s/m <sup>2</sup> ]				
Specific leakage at 50 Pa, $w_{50}$ [L/s/m <sup>2</sup> ]	0,2680	0,0130	0,5230	+/-95,2%
Effective leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	40,59	38,47	42,82	+/-5,5%
Equivalent leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	66,53	63,07	70,19	+/-5,4%
Normalized leakage area at 50 Pa [cm <sup>2</sup> /m <sup>2</sup> ]				

Measured pressure [Pa]		-22,9	-25,8	-50,2	-50,5	-54,0							
Fan #1, Range C1	Fan Pressure [Pa]	15,6	17,6	43,0	42,7	42,5							
	Flow [L/s]	22,12	23,64	39,15	38,95	38,55							
Total Flow, $V_r$ [L/s]		22,12	23,64	39,15	38,95	38,55							
Corrected Flow, $V_{env}$ [L/s]		21,37	22,83	37,81	37,62	37,23							
Error [%]		0,6%	-1,1%	2,7%	1,8%	-3,9%							

5 induced pressures each taken for 10 of the required 10 seconds.

5 baseline pressures each taken for 5 of required 5 seconds.

Static Pressure Averages:			
initial [Pa]	$\Delta P01$ 0,17	$\Delta P01$ -0,27	$\Delta P01$ +0,63
final [Pa]	$\Delta P02$ 0,19	$\Delta P02$ -0,19	$\Delta P02$ +0,32

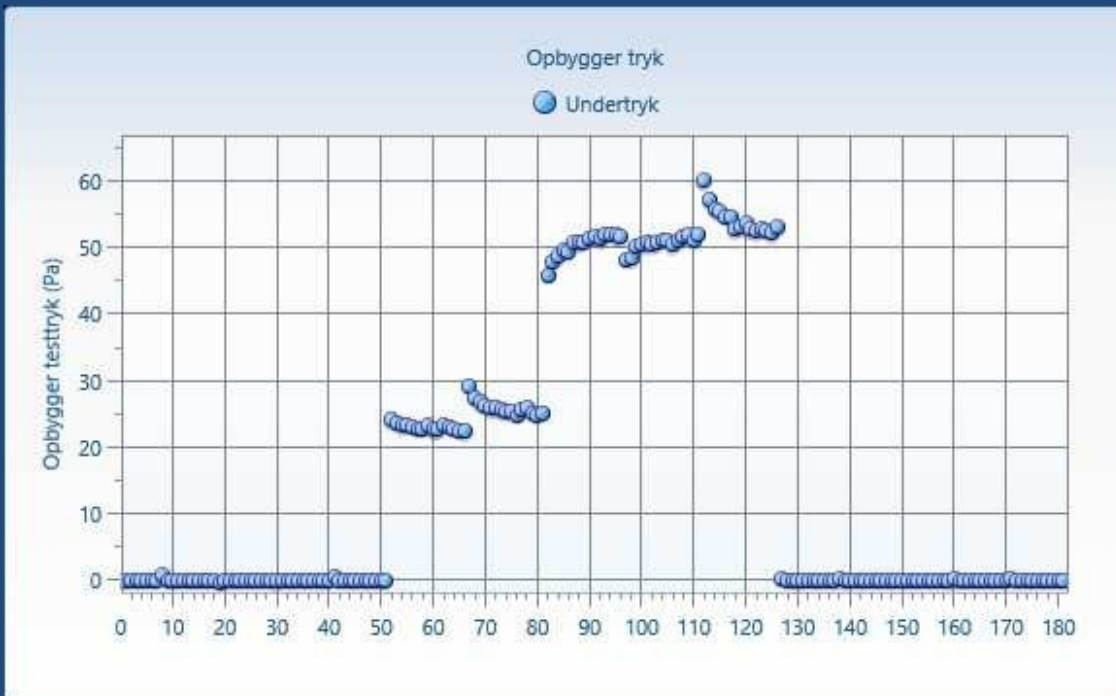
Baseline, initial [Pa]	0,00	0,70	-0,29	-0,10	0,49								
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Baseline, final [Pa]	0,34	0,20	-0,03	0,10	0,33						
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### Induced Pressure vs. Flow (Undertryk Set)



### Building Gauge Pressure (Undertryk Set)



## Overtryk Data Set

Test Dataset Date and Time: 2016-04-29-07:08

FinishTime: 07:15

Environmental Conditions		
Wind speed:	2: Let brise	from the
Operator Location:	Indendørs the building	
Initial Bias Pressure:	0,12 Pa	
Final Bias Pressure:	-0,06 Pa	
Initial Temperature:	indoors: 20	outdoors: 10.
Final Temperature:	indoors: 20	outdoors: 10.
Barometric Pressure	101,3 kPa	from Standardtemperatur og tryk

Overtryk Test Analysis				
Correlation, r [%]:	98,42			
	Mean	95% confidence limits		Uncertainty
		Lower	Upper	
Slope, n:	0,609	0,40772	0,80977	
Air leakage coefficient, $C_{env}$ [L/s/Pa <sup>n</sup> ]:	3,0220	1,469	6,216	
Air leakage coefficient, $C_L$ [L/s/Pa <sup>n</sup> ]:	3,0220	1,469	6,216	
Air flow at 50 Pa, $V_{50}$ [L/s]	32,699	30,10	35,52	+/-8,3%
Air changes at 50 Pa, $n_{50}$ [/h]				
Permeability at 50 Pa, $q_{50}$ [L/s/m <sup>2</sup> ]				
Specific leakage at 50 Pa, $w_{50}$ [L/s/m <sup>2</sup> ]	0,2370	0,0110	0,4629	+/-95,4%
Effective leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	35,88	33,03	38,98	+/-8,6%
Equivalent leakage area at 50 Pa, $A_L$ [cm <sup>2</sup> ]	58,82	54,14	63,90	+/-8,3%
Normalized leakage area at 50 Pa [cm <sup>2</sup> /m <sup>2</sup> ]				

Measured pressure [Pa]		27,3	28,2	34,7	43,4	51,2							
Fan #1, Range C1	Fan Pressure [Pa]	44,4	44,8	54,6	70,9	84,2							
	Flow [L/s]	22,98	22,49	24,56	29,78	32,91							
Total Flow, $V_r$ [L/s]		22,98	22,49	24,56	29,78	32,91							
Corrected Flow, $V_{env}$ [L/s]		23,38	22,89	24,99	30,30	33,49							
Error [%]		3,3%	-0,7%	-4,6%	1,1%	1,0%							



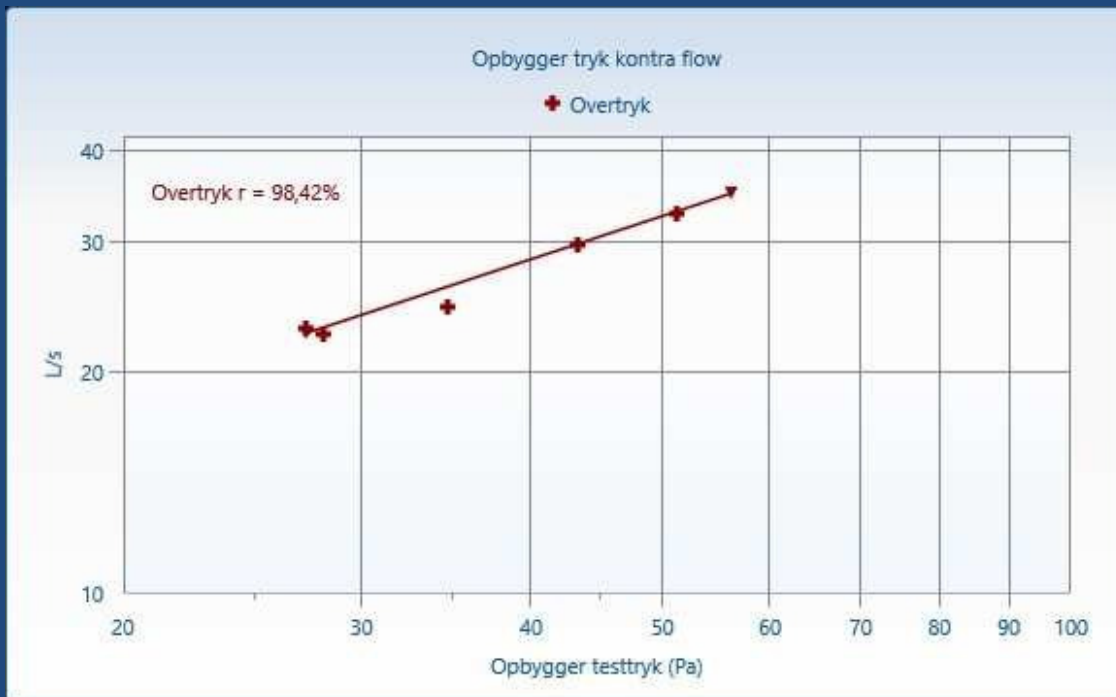
5 induced pressures each taken for 10 of the required 10 seconds.

5 baseline pressures each taken for 5 of required 5 seconds.

Static Pressure Averages:			
initial [Pa]	$\Delta P01$ 0,12	$\Delta P01-$ -0,23	$\Delta P01+$ 0,49
final [Pa]	$\Delta P02$ -0,06	$\Delta P02-$ -0,61	$\Delta P02+$ 0,46

Baseline, initial [Pa]	0,61	0,49	-	-	-							
Baseline, final [Pa]	0,16	-	0,73	-	-							
		0,03		0,20	0,93							

### Induced Pressure vs. Flow (Overtryk Set)



# Building Gauge Pressure (Overtryk Set)



## Test Equipment

The following test equipment was used in the performance of the air leakage tests.

	Fan	Fan serial	Fan location	Gauge	Gauge serial	Gauge Calibration
#1	Retrotec 2000			DM-2	202348	

### Fan Calibration Certificate Retrotec 2000:

Retrotec 2000 Fan last calibrated: (Ventilator kalibrering - B1) . Published Flow Equation Parameters, Round B1 CFM							
Range	n	K	K1	K2	K3	K4	MF
Open(22)	0,5214	519,6183	-0,07	0,8	-0,115	1	8,6
A	0,503	264,9959	-0,075	1	0	1	12
B	0,5	174,8824	0	0,3	0	1	10
C8	0,5	78,5	-0,02	0,5	0,016	1	10
C6	0,505	61,3	0,054	0,5	0,004	1	10
C4	0,5077	42	0,009	0,5	0,0009	1	10
C2	0,52	22	0,11	0,5	-0,001	1	10
C1	0,541	11,9239	0,13	0,4	-0,0014	1	10
L4	0,48	4,0995	0,003	1	0,0004	1	10
L2	0,502	2,0678	0	0,5	0,0001	1	10
L1	0,4925	1,1614	0,1	0,5	0,0001	1	10

Fan Pressure (FP) is the measured fan pressure when using a self-referenced fan or when Room Pressure is negative. If using a fan which is not self-referenced, and Room Pressure is positive, Fan Pressure is calculated by subtracting the measured Room Pressure from the Absolute Value of the Fan Pressure.

If  $PrA > 0$  and fan is not self-referencing:  $FP = |PrB| - PrA$

If  $PrA < 0$  or fan is self-referencing:  $FP = PrB$

Flow calculations are not valid if Fan Pressure is less than either MF or  $(K2 \times |CR|)$ .

Flow in CFM using the above coefficients is calculated as follows for standard Ranges:

$$\text{Flow} = (FP - CR \times K1)^n \times (K + K3 \times FP) \times K4$$

FP = fan pressure, CR = corrected room pressure